

NOTES ON SOME INDIAN LEPIDOPTERA WITH ABNORMAL HABITS

BY

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It is a fact well known to all entomologists that the great majority of butterflies and moths (Lepidoptera) are plant feeders, either found on growing plants or breeding in dry vegetable matter; a few are also found on clothes, wool and fur, but very few exhibit the abnormal habit of living in company with other insects and often at the expense of the latter. While instances of Lepidoptera which are subject to the unsolicited attentions of other insects, especially of parasites and predators of sorts, are numerous and quite common all over the world, examples of moths or butterflies which seek the company of other insects and live in association with them appear to be comparatively few; and in some of the known cases our knowledge of the mutual relations between such hosts and guests is also quite imperfect. In spite of these facts, the few Lepidoptera that exhibit such abnormal habits are not uncommon in different parts of India, and observations on their bionomics go to show that some of them are also of economic importance. This paper presents a brief record of some of the observations made by the writer on the bionomics of a few such Lepidoptera with curious habits noted so far from South India; incidentally a few records of such examples noted by others in different parts of India are also included, the idea being to make the whole paper a brief summary of our knowledge of entomophilous or entomophagous Lepidoptera recorded so far from India.

Butterflies.—Among the Rhopalocera the Lycænid species *Spalgis epius*, West. is the only insect so far known, which has been found to seriously interfere with the economy of other insects. The caterpillar of this butterfly, unlike other known forms of the group which are free living and mostly phytophagous, is predaceous on different kinds of mealy bugs. It has been noted on the often injurious mealy bug *Phenacoccus iceryoides*, Gr. in Coimbatore and in other parts of India; and in Ceylon Green¹ has noted it on *Phenacoccus glomeratus*, Gr. and *Pseudococcus lilacinus*, Ckll. Recently in Coimbatore the butterfly was found in numbers on the mealy bug *Pseudococcus citri*, R. which was badly infesting some Agathi (*Sesbania grandiflora*) plants and also on *Phenacoccus iceryoides*, Gr. infesting plants such as *Pithecolobium saman*, *Odina odia* and *Dolichos lablab*. The thick set fleshy caterpillar with the hidden head and limbs and covered with a white mealy coating slowly

¹ E. E. Green, *Coccidæ of Ceylon*, vol. v, p. 396, 1922.

moving in the midst of a colony of mealy bugs forms an excellent example of insect camouflage and is often mistaken for a mealy bug. The naked chrysalis into which the caterpillar changes and which is found generally attached to the plant surface on which the host and guest are found, presents a curious appearance to the casual observer; it is not unlike the face of a monkey in general contour and is known as the monkey face pupa¹ (). The colour is dark greyish with a mealy pubescence here and there over the surface. The adult butterfly that emerges out of this monkey face pupa is of medium size and has dark brown wings with a pale white spot on each fore wing. Sometimes swarms of these butterflies congregate on plants where there are masses of mealy bugs, evidently for the purpose of oviposition. From observations made, one is led to infer that this insect plays the part of an efficient natural check on some of the destructive mealy bugs, and attempts may be made whenever possible to test the efficacy of the insect by utilizing it by artificial methods.

Speaking of lycaenid larvae, it is not uncommon to find some of them associated with ants of different kinds; the writer has noted this particularly in the case of the *Zizyphus*-leaf caterpillar *Tarucus theophrastes*, F. But in such cases it will be found that the ants seek the caterpillar for some sweet secretion, and as such, the caterpillar is only the passive agent and not the aggressive or active party, as in the case of *Spalgus*.

Moths.—Coming to the group of moths, over half a dozen Indian forms are so far known living in active association with other insects, and in some cases causing definite injury to the hosts. Of the latter, some of the species of the noctuid genus *Eublemma* are the best known and very widely distributed. The caterpillars of these species are predaceous on different kinds of scale insects, and in the case of those Coccid hosts which are bad pests of different cultivated plants, the caterpillars often act as very effective natural enemies. The following Coccid feeding species of *Eublemma* are known from India and Ceylon:—

*E. coccidiphaga*² feeding on some species of the scale *Lecanium* in Ceylon, and on the 'lac' insect in North India.

*E. vinotincta*³ on *Lecanium* sp. Ceylon.

*E. amabilis*⁴ on Lac insect. All over India and Ceylon.

E. scitula in South India⁵ and probably in North India too.

Of these forms *E. scitula* R. has been noted to be commonest in South India. In Coimbatore the writer has bred this moth from caterpillars found predaceous on

1. *Pulvinaria maxima*, Gr. a pretty bad pest of Nim (*Melia*) trees in and around Coimbatore.

¹ E. H. Aitken, *Bombay Natural History Society Journal*, vol. viii, p. 485, 1894.

² G. Hampson, *Catalogue of Phalange*, British Museum, vol. x.

³ *Ibid.*

⁴ C. S. Misra, *Bulletin on Lac*, Pusa. (No. 142), 1923.

⁵ Ramakrishna Ayyar, *Memoir on Pulvinaria maxima* Gr., *Pusa Ent. Memoirs*, vol. vii, 1925.

2. *Anomalococcus indicus*, Gr. equally bad on 'Babul' tree (*Acacia arabica*) in and around Coimbatore.

3. *Ceroplastodes cajani*, Gr. a pretty bad pest on *Ocimum sanctum*, Red gram, Lablab, etc.; also in different parts of South India.

4. *Ceroplastes ceriferus*, A. The Indian white wax insect found on various plants, *Lawsonia*, Mango, etc.

5. *Tachardia lacca*, K. On *Zizyphus*, Rain tree, *Butea*, etc.

6. *Lecanium hemisphaericum*, T. On Ferns, Sandal Wood, Guava, etc.

7. *Pseudococcus lilacinus*, Ckll. On *Ailanthus excelsa* shoots.

This insect has been noted on *Pulvinaria psidii*, Gr. and *Lecanium hemisphaericum* also in Mysore.¹ In Coimbatore it is not found so commonly on *spp.* of *Lecanium* as on *Pulvinaria maxima*, *Anomalococcus indica* and the *Lac* insect.

Though in the case of Coccid pests the *Eublemma* caterpillar performs the function of a beneficial agent, in the case of the *lac* insect which is useful to man, this moth unfortunately proves a serious pest by devouring the lac scale and the lac encrustations; in some tracts the ravages of this caterpillar are so very bad that its control and prevention from being carried from place to place with brood lac, have become serious problems. In South India an interesting Braconid wasp² (*Aphrastobracon flavipennis* Ashm.) has been discovered by the writer as a parasite on the predatory *Eublemma* caterpillar. This parasitic wasp, therefore, is a useful agent in the case of the *Eublemma* caterpillar on lac, while it is not so when the caterpillar infests plants of economic importance. The life-history of *E. scitula* is practically similar to that of *E. amabilis* described by Misra.³ On stems and shoots, covered by the host insect, the moth lays its egg singly in the midst of the scales, often on the bodies of the latter. The eggs are of a shining pinkish brown colour with a bluish tinge, spherical in shape, and beautifully sculptured. The caterpillar that hatches out feeds on the soft portions of the growing scales one after the other and covers its body with a case or house made up of the empty scales of its victims cemented together. With this covering the creature moves like a limpet among the colonies of scales, especially when the host is a *Pulvinaria* or *Lecanium* and devours the soft parts of a number of these latter. The presence of this predatory enemy on a scale infested branch can be easily made out by the sickly appearance of some of the growing female insects inside which the young caterpillar might be feeding, or in other cases by the presence of the conical houses of the caterpillar which are distinctly bigger than the scales around; the characteristic locomotion of the caterpillar drawing the house with it is also another indication. The larva becomes helpless without this dome-shaped covering and its body has become adapted to occupy this artificial house. The posterior

¹ Coleman and Kannan, *Scale Insect Pests of Coffee in S. India*, 1918.

² Ramakrishna Ayyar, 'The Genus *Aphrastobracon*', *Bull. of Ent. Res.*, vol. xviii, 1926, p. 91.

³ C. S. Misra, *Bulletin on Lac*, Pusa, 1923 (No. 142).

region of the abdomen becomes swollen and gets attached to the inner surface of the shell by means of the muscular suckers provided with numerous horny hooks. The head end is narrower. The prolegs are reduced to three active pairs including the two anal claspers transformed into suckers for fixing on to the shell. The body becomes fleshy and plumpy. A full-grown caterpillar has a pale fleshy-brown colour with the head, prothoracic shield and the tips of the thoracic legs shining black. It measures about 6 to 6.5 mm. just before pupating and the colour becomes greyish-white. Pupation takes place inside the dome-like house itself, which is turned by the larva into a cocoon by the closing the ventral opening of the shell with a pale white screen of silk. The chrysalis taken out of the cocoon measures 6 mm. and is of a light greenish-brown colour soon after pupation. It is cylindrical with the anterior end roundish and the posterior bluntly pointed; the latter bears five short brown bristles arising from small chitinous tubercles. The moth is a small pale white insect with olive brown marks on the wing. In certain seasons it is not an uncommon sight in and around Coimbatore to find stems and branches of *Acacia* trees infested with the scale *Anomalococcus indicus*, Gr. covered with clusters of *Eublemma* cocoons by the thousand; of course, the caterpillar often harbours its own enemy in turn, viz. the braconid wasp mentioned above.

Before leaving *Eublemma* it may be worth while pointing out that *E. scitula* R. is one of those natural enemies which had attracted the attention of pioneers in the biological method of pest control some years ago; under its other name *Erastria scitula* R., material of this insect was transported from Italy to California¹ for trials in checking the Olive scale *Lecanium oleæ* in that state. Another species of *Eublemma*—*E. gayneri* Rot is recorded by Hall² as a predator on the mealy bug *Phenacoccus hirsutus* in Egypt.

The interesting but little known family of moths called *Epipyropidae* includes species of caterpillars which have been noted to live in close association with different forms of homopterous bugs. Fletcher's³ account of the known Indian forms gives some information about this family in India. Hardly anything definite is known regarding their bionomics, especially as to whether the caterpillar causes any injury to the homopteron or merely lives on as a scavenger or a help-mate. *Epipyrops polygrapha* H. and *E. eurybrachides*, Fl. are two definitely known Indian species both bred from the fulgorid *Eurybrachus tomentosus* in Coorg and Coimbatore.⁴ Species of *Epipyropidae* have also been noted in Central Provinces and Mysore. In a paper on 'The Natural Enemies of the Mangohopper (*Idiocerus* spp.)' in Mysore by my brother T. V. Subramaniam there is a record of an *Epipyropid* which is described as a new species

¹ *Insect Life, U.S.A.*, vol. vi, p. 10, 1894.

² W. J. Hall, *Bulletin 17, Ministry of Agriculture, Egypt*, on 'Hibiscus Mealy Bug', p. 25, 1921.

³ T. B. Fletcher, *Report of the Third Entomological Meeting*, Pusa, 1919.

⁴ *Ibid.*

(*Epipyrops fuliginosa*) (see pp. 466 and 468 of *Bull. Ent. Res.* xii, 1922). Recently while engaged in observing the bionomics of a fulgorid *Ricania bicolorata* a minor pest of coffee and citrus and very common on the Nilgiris early in summer, the writer came across a caterpillar among the nymphs of the bug, which latter possess profuse waxy tassels; but unfortunately the caterpillar dried up before maturing, probably this was either an Epipyropid or the caterpillar of the moth *Ancylis glycyphaga* Meyr. noted elsewhere in this paper. It is not unlikely that more Epipyropidæ will be met with on species of homopterous bugs like *Fulgora*, *Eurybrachys*, *Ricania*, *Kalidasa*, etc., species which are in certain seasons found in swarms along the Nilgiri slopes.

Among the Microlepidoptera a few forms have been noted associated with other insects, but the relationship in some of these cases is still not quite clear. These are—

Ancylis glycephaga, Meyr.¹ noted to breed on the sugary secretion of the homopterous bug *Phromnia marginella* in Pusa appears a doubtful case.

Pammena isocampta, Meyr.² noted to feed on scale *Lecanium* sp.; locality—Paradeniya, Ceylon.

Brachmia xerophaga, Meyr.³ Found breeding in nests of spider living among insect remains and grass; Madras, a scavenger?

Anatrachyntis falcata, St. On the lac insect in Ceylon⁴ and on mealy bugs (*Dactylopius*) in Pusa.⁵

Holcocera (Hypatima) pulverca, Meyr. Noted by cultivators of lac in North India both on the living and stored lac, known to be a very serious pest on lac.

Ancylis and *Brachmia* do not appear to be injurious to the host, while the others are more or less harmful to Coccidae—particularly to the lac insect. In a recent paper by Bassinger, it is found that a moth *Holcocera iceryaella*, for a long time supposed to be beneficial as being predatory on scales has recently been noted as a pest of oranges in California.⁶ A fairly well known Microlepidopteron outside India which also attracted the attention of early parasite collectors similar to *Eublemma scitula* R. is an Australian Coccid-feeding moth *Talpocharis coccophaga*,⁷ Meyr which was taken to California for trial against scale pests.

Coming to the family Pyralidæ, the wax moth—*Galleria mellonella* L. is a notorious pest of bee hives found apparently all over the world. Though it does not directly affect the bees themselves, the insect causes a considerable amount of damage to the hives. The dark brown moth lays eggs on the wax combs often in groups and from there the caterpillars hatch out and feed on the wax. The dirty yellowish white caterpillar which grows to about an inch

¹ T. B. Fletcher, *Pusa Ent. Series Memoirs*, vol. vi, p. 45, 1921.

² E. Meyrick, *Exotic Microlepidoptera*, vol. i, p. 196, 1914.

³ E. Meyrick, *Ento. Month. Magazine*, 1914, p. 219.

⁴ E. Meyrick, *Bombay Nat. His. Soc. Jour.*, vol. xvi, p. 607, 1905.

⁵ T. B. Fletcher, *Pusa Ent. Series Memoirs*, vol. vi, p. 45, 1921.

⁶ A. J. Basinger, *Journal of Economic Entomology*, 1924, p. 637.

⁷ W. W. Froggatt, *Agr. Gaz. N. S. Wales*, 1910, p. 801.

in length tunnels through the waxen frame work of the combs and covers them with webbing of silk, in some cases the inhabitants of a bee colony are compelled to desert the hive due to the depredation of this caterpillar. It is interesting to note that the wasp *Nemeritis canescens*, Grav, has been recently noted by Richmond as a parasite of the wax moth in Colorado. With the wax moth may be included some sphingidæ, especially the *spp.* of *Acherontia* (Death's-head Moth) which rob the bees of their honey from their hives. Among the Pyralidæ there is another example—a Phycitine moth (*Phycita dentilinella*), the caterpillar of which was first noted by the writer in Coimbatore as early as 1914, often living in association with the chrysalis of a Limacodid caterpillar *Parasa lepida*—the common 'nettle grub' of South India. This predatory caterpillar appears in numbers in certain years and a good percentage of the cocoons of the Limacodid harbour the predatory larva. The life-history of this predatory caterpillar has not yet been fully observed, but since the caterpillar is found more in evidence inside the cocoons of the host, it appears likely that the predatory moth lays eggs on the nettle grub at an advanced stage just before it begins to spin its cocoon. Cocoons containing the caterpillar side by side with the chrysalis of the host appear somewhat weak and yielding to pressure unlike healthy cocoons which are hard and shell-like; the predatory caterpillar is short and is of a pinkish-brown colour. This moth has also been recorded from Bengal¹ as feeding on the wild silk worm *Cricula trifenestrata*.

In September 1924 while collecting and making observations on different Coccidæ in and around the Coimbatore Agricultural College, numerous examples of a giant scale insect (*Aspidoproctus xyliæ*, Gr. M.S) were noted on a few rain trees (*Pithecolobium saman*). In the course of a study of this insect in captivity it was a surprise to find that some of these big dome-shaped scales harboured one or more larvæ of a species of Lepidoptera. Numerous specimens of the adult moth were reared out in captivity and the species has since been kindly identified by the Imperial Bureau of Entomology as *Euzophera cocciphaga*, H. The insect was originally noted in Sikkim and the only information about it in Hampson's description² is that 'the larva lives under a Coccid on which it feeds'. A few notes on the bionomics of this insect as studied at Coimbatore are added below:—

One or more caterpillars and pupæ are found inside some of the infested scales. The external indication of a scale badly infested with the caterpillar is the presence of a dirty grey attachment of silk and frass all round the base of the scale fixing the same firmly to the plant surface. In course of time each infested scales become partially dark coloured and sickly. This habit of the caterpillar in binding the scale all round with such an attachment appears to be a device to prevent the Coccid embryos, which hatch out in hundreds

¹ H. M. Lefroy, *Indian Insect Life*, p. 514, 1919.

² G. Hampson, *Bombay Natural History Society Journal*, vol. xviii, p. 262, 1908.

from inside the Coccid, frown crawling out from beneath the mother insect as is normally the case. It was noted that, while from these scales which had the firm silken fastening at the base no embryos emerged even after longer periods, from others where there was no fastening or where the attachment was interfered with and small passages made, the small flattish golden coloured coccid larvæ with their fringe of long hairs characteristic of this scale began to emerge and crawl over the plant surface in numbers. Some of the cemented scales when opened contain two or three caterpillars in different stages of growth or one or two pupæ in tough silken tubular galleries in the midst of dead and partially destroyed eggs and embryos of the host. From observations made so far, the caterpillar appears to be predatory and in order to secure its own safety and conserve its food, which apparently consists of the eggs and larvæ of the coccid, it constructs the firm attachment around the base of its host. The following points so far noted in its life-history may be added. Glistening light greenish-yellow eggs are found laid singly on the dorsal surface of the host insect mostly at the posterior region. The egg is spherical and flattish resembling a scale with the surface beautifully reticulated. Numerous eggs are found laid on single coccids though the exact number laid by each moth was not observed. The young caterpillar that hatches out crawls about the posterior edges of the scale insect for a time and gradually disappears inside the latter entering the same by making a passage through the ventral region. Gradually the caterpillar or if there are more, these caterpillars fix the host scale to the plant surface by means of the fastening described above. A fairly well-known caterpillar about to pupate measures 6.5 mm. In colour it is greyish green above, pale gray below, head and prothorax dark brown, and head almost black. A glistening hemispherical spot is found on each dorso-lateral side of the mesothoracic region dark in colour and enclosing a glistening space giving rise to one or two hairs. Similar but much smaller ones are found on the dorso-lateral region of the penultimate abdominal segment also. Spiracles are light brown and the body is fringed with short isolated transparent hairs. Two or three very faint longitudinal stripes are seen in some specimens along the dorsal region. Pupation takes place within a tubular closely woven silken cocoon inside the host scale. Pupa is 6 mm. long, general form short and stout, colour reddish brown, wing sheaths and ventral region of a paler brown; there are two short dark spines at the posterior tip. The pupation period in some cases noted in captivity in November lasted 7 to 10 days. The moth is dark greyish-brown in colour. Each upper wing has a double transverse dark marking. The palpi are upturned and sickle shaped. Compared to the hinder ones, the first pair of legs are much smaller. While resting the moth has the head end raised and the hind end lowered, the wing tips touching the sitting surface. As far as the writer is aware this moth appears to be first recorded example of a lepidopterous insect living in association with the giant Coccidæ of the family Monophlebinæ, and the only recorded example of a Pyralid found in association with Coccidæ.

There is no doubt that many more cases of moths or butterflies with these curious habits might exist in different parts of India and discovered in due course of time. As stated before this paper is just an attempt to invite the attention of entomological workers all over India to this aspect of insect bionomics—an aspect which is not only of biological interest to the pure scientist, but has its own economic importance and value.